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ABSTRACT

The United States Training and Employment Service General Aptitude Test Battery (GATB), first published in 1947, has been included in a continuing program of research to validate the tests against success in many different occupations. The GATB consists of 12 tests which measure nine aptitudes: General Learning Ability; Verbal Aptitude; Numerical Aptitude; Spatial Aptitude; Form Perception; Clerical Perception; Motor Coordination; Finger Dexterity; and Manual Dexterity. The aptitude scores are standard scores with 100 as the average for the general working population, and a standard deviation of 20. Occupational norms are established in terms of minimum qualifying scores for each of the significant aptitude measures which, when combined, predict job performance. Cutting scores are set only for those aptitudes which aid in predicting the performance of the job duties of the experimental sample. The GATB norms described are appropriate only for jobs with content similar to that shown in the job description presented in this report. A description of the validation sample and a personnel evaluation form are also included. (AG)

July 1967 United States Employment Service Test Research Report S-394

S-394

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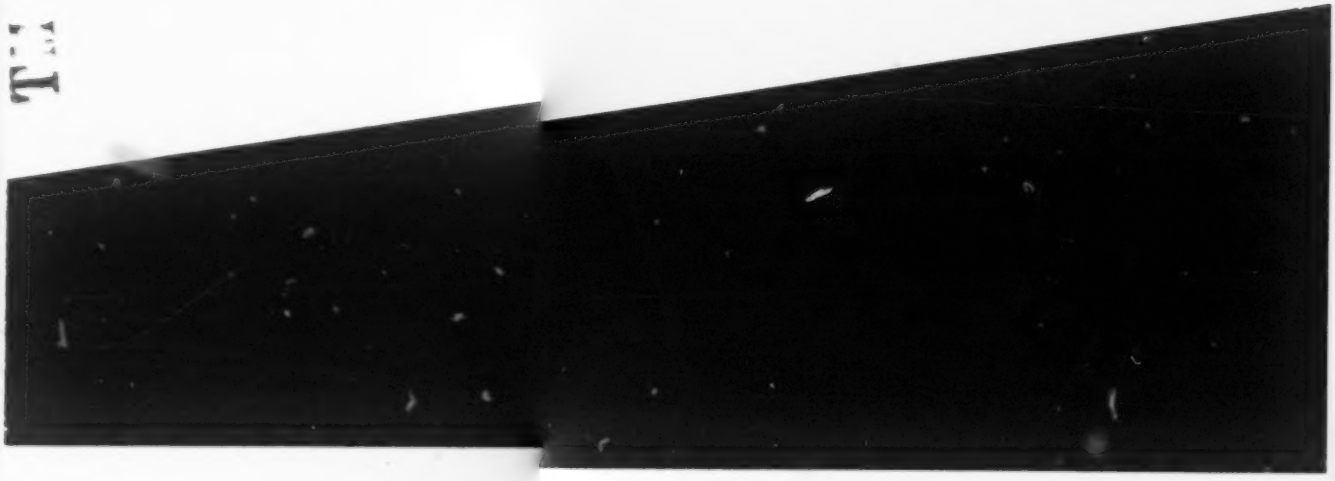
Development of USES Aptitude Test Battery for Envelope-Machine Set-Up Man (paper goods) 641.780



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Technical Report on Development of USES Test Battery

For . . . . . .

Envelope-Machine Set-Up Man (paper goods)
641.780

S-394

U.S. Employment Service
in Cooperation with
New York State Employment Service

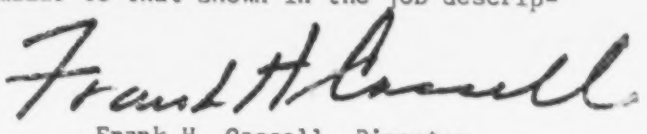
July 1967

FOREWORD

The United States Employment Service General Aptitude Test Battery (GATB) was first published in 1947. Since that time the GATB has been included in a continuing program of research to validate the tests against success in many different occupations. Because of its extensive research base the GATB has come to be recognized as the best validated multiple aptitude test battery in existence for use in vocational guidance.

The GATB consists of 12 tests which measure 9 aptitudes: General Learning Ability, Verbal Aptitude, Numerical Aptitude, Spatial Aptitude, Form Perception, Clerical Perception, Motor Coordination, Finger Dexterity, and Manual Dexterity. The aptitude scores are standard scores with 100 as the average for the general working population, with a standard deviation of 20.

Occupational norms are established in terms of minimum qualifying scores for each of the significant aptitude measures which, in combination, predict job performance. For any given occupation, cutting scores are set only for those aptitudes which contribute to the prediction of performance of the job duties of the experimental sample. It is important to recognize that another job might have the same job title but the job content might not be similar. The GATB norms described in this report are appropriate for use only for jobs with content similar to that shown in the job description included in this report.



Frank H. Cassell, Director
U. S. Employment Service

S-394

GATB Study #2646

DEVELOPMENT OF USES APTITUDE TEST BATTERY

For

Envelope-Machine Set-Up Man (paper goods)
641.780-010

This report describes research undertaken for the purpose of developing General Aptitude Test Battery (GATB) norms for the occupation of Envelope-Machine Set-Up Man (paper goods) 641.780. The following norms were established:

GATB Aptitudes	Minimum Acceptable GATB Scores
S - Spatial Aptitude	75
P - Form Perception	85
K - Motor Coordination	80

RESEARCH SUMMARY

Sample:

51 male workers employed as Envelope-Machine Set-Up Men in various plants in the New York City area.

Criterion:

Supervisory ratings

Design:

Concurrent (test and criterion data were collected at approximately the same time).

Minimum aptitude requirements were determined on the basis of a job analysis and statistical analyses of aptitude mean scores, standard deviations, aptitude criterion correlations and selective efficiencies.

Concurrent Validity:

Phi Coefficient = .40 ($P/2 < .005$)

Effectiveness of Norms:

Only 65% of the non-test selected workers used for this study were good workers; if the workers had been test - selected with the S-394 norms, 82% would have been good workers . 35% of the non-test-selected workers used for this study were poor workers; if the workers had been test-selected with the S-394 norms, only 18% would have been poor workers. The effectiveness of the norms in shown graphically in Table 1:

TABLE 1

Effectiveness of Norms

	Without Tests	With Tests
Good Workers	65%	82%
Poor Workers	35%	18%

SAMPLE DESCRIPTION

Size:

N=51 and N=44. There was reason to question the validity of the data obtained from one plant because of its poor cooperation. Consequently the data is shown both including and excluding this sample.

Occupational Status:

Employed workers

Work Setting:

Mr. William McManus of the Envelope Manufacturers' Association helped in the planning of this study and assisted in obtaining the cooperation of the following employers in the New York City area Champion Envelope Company; Commerical Envelope Company; Envelope Converters Company; Exclusive Envelope Company; General Paper Goods; Gray Envelope Company; Karalton Envelope (Division of Kimberly-Clark); Kent Paper Company, Inc.; Urgler Envelope.

Employer Selection Requirements:

Education: No requirement.

Previous Experience: Previous experience as an Envelope Machine Operator preferred; other machine operating experience acceptable.

Principal Activities:

The job duties for each worker are comparable to those shown in the job description in the Appendix.

Minimum Experience:

All workers in the sample had at least 12 months total job experience.

TABLE 2

Means, Standard Deviations (SD), Ranges, and Pearson Product-Moment Correlations with the Criterion (r) for Age, Education, and Experience.

	Mean		SD		Range		r	
	N=51	N=44	N=51	N=44	N=51	N=44	N=51	N=44
Age (years)	38.9	39.1	10.0	9.6	20-63	23-63	.097	.146
Education (years)	10.6	10.7	1.6	1.6	6-16	6-16	.158	.210
Experience (years)	12.4	13.2	9.6	9.9	1-42	1-42	.385**	.348*

* Significant at the .05 level
** Significant at the .01 level

EXPERIMENTAL TEST BATTERY

All 12 tests of the GATB were administered during September, 1965.

CRITERION

The criterion data consisted of supervisory ratings of job proficiency made at approximately the same time as test data were collected. Two sets of independent ratings were made by first-line supervisors approximately two months apart.

Rating Scale: USES Form SP-21 "Descriptive Rating Scale". This scale (see Appendix) consists of nine items covering different aspects of job performance. Each item has five alternatives corresponding to different degrees of job proficiency.

Reliability: The correlation between the two independent ratings was .94. This correlation is based on ratings from all participating firms with one exception where second ratings were never completed. Therefore, the first ratings were used as the final criterion.

Criterion Score Distribution:

	N=51	N=44
Possible Range:	9-45	9-45
Actual Range:	10-42	19-42
Mean:	30.2	31.4
Standard Deviation:	7.6	6.4

Criterion Dichotomy: The criterion distribution was dichotomized into low and high groups by placing 35% of the sample in the low group to correspond with the percentage of workers considered unsatisfactory or marginal. Workers in the high criterion group were considered "good workers" and those in the low group as "poor workers". The critical score is 27.

APTITUDES CONSIDERED FOR INCLUSION IN THE NORMS

Aptitudes were considered for inclusion in the norms on the basis of a qualitative analysis of job duties involved and statistical analyses of test and criterion data. Aptitudes F and M were considered for inclusion in the norms because the qualitative analysis indicated the importance of these aptitudes for the job duties and the sample had relatively high mean scores on these Aptitudes. Tables 3, 4, and 5 show the results of the qualitative and statistical analyses.

TABLE 3

Qualitative Analysis
(Based on the job description, the aptitudes indicated appear to be important to the work performed)

Aptitude	Rationale
S - Spatial Aptitude	Necessary for diagnosing probable cause of malfunction of machine.
P - Form Perception	Necessary in recognizing irregularities when inspecting envelopes.
K - Motor Coordination	Necessary in making rapid adjustments for different sizes and shapes of envelopes.
F - Finger Dexterity	Necessary in dismantling and repairing machines.
M - Manual Dexterity	Necessary in using hand tools to repair machines.

TABLE 4

Means, Standard Deviations (SD), Pearson Product-Moment Correlations with the Criterion (r) for the Aptitudes of the GATB

Aptitude	Mean		SD		Range	r	
	N=51	N=44	N=51	N=44		N=51	N=44
G - General Learning Ability	91.6	91.2	15.2	15.2	60-128	.336*	.522**
V - Verbal Aptitude	90.5	89.6	12.8	11.8	66-127	.292*	.492**
N - Numerical Aptitude	90.4	90.0	17.2	17.3	57-130	.264	.456**
S - Spatial Aptitude	98.3	98.3	18.6	18.6	61-133	.278*	.377*
P - Form Perception	95.3	95.2	18.8	18.3	60-157	.221	.314*
Q - Clerical Perception	96.4	96.8	10.3	10.4	79-115	.222	.220
K - Motor Coordination	96.0	97.0	19.7	18.6	56-144	.368**	.339*
F - Finger Dexterity	97.6	98.0	17.6	17.4	57-151#	.109	.110
M - Manual Dexterity	106.5	106.7	20.0	18.3	71-154	.113	.113

#Range shown is for N=51. Range on Aptitude F for N=44 is 57-151. Ranges on all other aptitudes are the same for both sample sizes.
*Significant at the .05 level
**Significant at the .01 level

TABLE 5

Summary of Qualitative and Quantitative Data

Type of Evidence	Aptitudes								
	G	V	N	S	P	Q	K	F	M
Job Analysis Data									
Important				X	X		X	X	X
Irrelevant									
Relatively High Mean				X				X	X
Relatively Low Standard Deviation		X				X			
Significant Correlation with Criterion	X	X		X	*		X		
Aptitudes to be Considered for Trial Norms	G			S	P*		K	F	M

*Aptitude P included on the basis of a significant correlation with the criterion for N=44 and the rating of importance in the qualitative analysis.

DERIVATION AND VALIDITY OF NORMS

Final norms were derived on the basis of a comparison of the degree to which trial norms consisting of various combinations of Aptitudes G, S, P, K, F, and M at trial cutting scores were able to differentiate between the 65% of the sample considered good workers and the 35% of the sample considered poor workers. Trial cutting scores at five point intervals approximately one standard deviation below the mean were tried because this will eliminate about one third of the sample with three-aptitude norms. For two-aptitude trial norms, minimum cutting scores slightly higher than one standard deviation below the mean will eliminate about one third of the sample; for four-aptitude trial norms, cutting scores slightly lower than one standard deviation below the mean will eliminate about one third of the sample. The Phi Coefficient was used as a basis for comparing trial norms. Norms of S-75, P-85, and K-80 provided optimum differentiation for the Occupation of Envelope-Machine Set-Up Man (paper goods) 641.780. The validity of these norms is shown in Table 6 and is indicated by a Phi Coefficient of .40 (statistically significant at the .005 level).

TABLE 6A (N=51)

Concurrent Validity of Test Norms S-75, P-85, and K-80

	Nonqualifying Test Scores	Qualifying Test Scores	Total
Good Workers	10	23	33
Poor Workers	13	5	18
Total	23	28	51

Phi Coefficient (ϕ) = .40
Chi Square (X^2) = 8.3
Significance Level = $P/2 < .005$

TABLE 6B (N=44)

Concurrent Validity of Test Norms S-75, P-85, and K-80

	Nonqualifying Test Scores	Qualifying Test Scores	Total
Good Workers	7	22	29
Poor Workers	11	4	15
Total	18	26	44

Phi Coefficient ($\emptyset$) = .47 Chi Square (X^2) = 9.9
Significance Level = $P/2 < .005$

DETERMINATION OF OCCUPATIONAL APTITUDE PATTERN

The data for this study did not meet the requirements for incorporating the occupation studied into any of the 36 OAP's included in Section II of the Manual for the General Aptitude Test Battery. The data for this sample will be considered for future groupings of occupations in the development of new occupational aptitude patterns.

SP-21
Rev. 2/61

A-P-P-E-N-D-I-X

DESCRIPTIVE RATING SCALE
(For Aptitude Test Development Studies)

Score____

RATING SCALE FOR _____
D. O. T. Title and Code

Directions: Please read Form SP-20, "Suggestions to Raters", and then fill in the items listed below. In making your ratings, only one box should be checked for each question.

Name of Worker (print) _____
(Last) (First)

Sex: Male_____ Female_____

Company Job Title: _____

How often do you see this worker in a work situation?

☐ See him at work all the time.

☐ See him at work several times a day.

☐ See him at work several times a week.

☐ Seldom see him in work situation.

How long have you worked with him?

☐ Under one month.

☐ One to two months.

☐ Three to five months.

☐ Six months or more.

A. How much work can he get done? (Worker's ability to make efficient use of his time and to work at high speed.)

- ☐ 1. Capable of very low work output. Can perform only at an unsatisfactory pace.
- ☐ 2. Capable of low work output. Can perform at a slow pace.
- ☐ 3. Capable of fair work output. Can perform at an acceptable but not a fast pace.
- ☐ 4. Capable of high work output. Can perform at a fast pace.
- ☐ 5. Capable of very high work output. Can perform at an unusually fast pace.

B. How good is the quality of his work? (Worker's ability to do high-grade work which meets quality standards.)

- ☐ 1. Performance is inferior and almost never meets minimum quality standards.
- ☐ 2. The grade of his work could stand improvement. Performance is usually acceptable but somewhat inferior in quality.
- ☐ 3. Performance is acceptable but usually not superior in quality.
- ☐ 4. Performance is usually superior in quality.
- ☐ 5. Performance is almost always of the highest quality.

C. How accurate is he in his work? (Worker's ability to avoid making mistakes.)

- ☐ 1. Makes very many mistakes. Work needs constant checking.
- ☐ 2. Makes frequent mistakes. Work needs more checking than is desirable.
- ☐ 3. Makes mistakes occasionally. Work needs only normal checking.
- ☐ 4. Makes few mistakes. Work seldom needs checking.
- ☐ 5. Rarely makes a mistake. Work almost never needs checking.

D. How much does he know about his job? (Worker's understanding of the principles, equipment, materials and methods that have to do directly or indirectly with his work.)

☐ 1. Has very limited knowledge. Does not know enough to do his job adequately.

☐ 2. Has little knowledge. Knows enough to "get by."

☐ 3. Has moderate amount of knowledge. Knows enough to do fair work.

☐ 4. Has broad knowledge. Knows enough to do good work.

☐ 5. Has complete knowledge. Knows his job thoroughly.

E. How much aptitude or facility does he have for this kind of work? (Worker's adeptness or knack for performing his job easily and well.)

☐ 1. Has great difficulty doing his job. Not at all suited to this kind of work.

☐ 2. Usually has some difficulty doing his job. Not too well suited to this kind of work.

☐ 3. Does his job without too much difficulty. Fairly well suited to this kind of work.

☐ 4. Usually does his job without difficulty. Well suited to this kind of work.

☐ 5. Does his job with great ease. Exceptionally well suited for this kind of work.

F. How large a variety of job duties can he perform efficiently? (Worker's ability to handle several different operations in his work.)

☐ 1. Cannot perform different operations adequately.

☐ 2. Can perform a limited number of different operations efficiently.

☐ 3. Can perform several different operations with reasonable efficiency.

☐ 4. Can perform many different operations efficiently.

☐ 5. Can perform an unusually large variety of different operations efficiently.

G. How resourceful is he when something different comes up or something out of the ordinary occurs? (Worker's ability to apply what he already knows to a new situation.)

☐ 1. Almost never is able to figure out what to do. Needs help on even minor problems.

☐ 2. Often has difficulty handling new situations. Needs help on all but simple problems.

☐ 3. Sometimes knows what to do, sometimes doesn't. Can deal with problems that are not too complex.

☐ 4. Usually able to handle new situations. Needs help on only complex problems.

☐ 5. Practically always figures out what to do himself. Rarely needs help, even on complex problems.

H. How many practical suggestions does he make for doing things in better ways? (Worker's ability to improve work methods.)

☐ 1. Sticks strictly with the routine. Contributes nothing in the way of practical suggestions.

☐ 2. Slow to see new ways to improve methods. Contributes few practical suggestions.

☐ 3. Neither quick nor slow to see new ways to improve methods. Contributes some practical suggestions.

☐ 4. Quick to see new ways to improve methods. Contributes more than his share of practical suggestions.

☐ 5. Extremely alert to see new ways to improve methods. Contributes an unusually large number of practical suggestions.

I. Considering all the factors already rated, and <u>only</u> these factors, how acceptable is his work? (Worker's "all-around" ability to do his job.)

☐ 1. Would be better off without him. Performance usually not acceptable.

☐ 2. Of limited value to the organization. Performance somewhat inferior.

☐ 3. A fairly proficient worker. Performance generally acceptable.

☐ 4. A valuable worker. Performance usually superior.

☐ 5. An unusually competent worker. Performance almost always top notch.

F
'ACT SHEET

Job Title: Envelope-Machine Set-Up M
an (paper goods) 641.780-010

Job Summary: Sets up and maintains o
ne or more wide-range window machines which make envelopes from die-cut blanks: Working from production order for envelopes, sets up or adjusts feed mechanism, al igner chain, printing press, window-cutting and patching, side and bottom flap scorin g and folding, and gumming and delivery portions of machine. Checks set-up. Diagnose s causes of malfunctions and corrects set-up. Performs maintenance work on machine.

Major Skills and/or Operations and Re
lated Knowledge in which Training is Necessary:

MAJOR SKILLS AND/OR OPERATIONS

A. Introduction
   1. Wide-Range Window Machine
      a. Nomenclature
      b. Use
      c. Various operations performed

B. Machine Operator
   1. Machine tending
   2. Observation
   3. Common malfunctions

C. Set-Up of feeder unit
   1. Variations
   2. Problems
   3. Checking set-up

D. Adjusting dryer and aligner chain
   1. Variations
   2. Areas of Difficulty
   3. Checking set-up

E. Printing Press
   1. Attaching rubber plates
   2. Selection of ink
   3. Ink feed

F. Window and patch cutting and gummin
   1. Setting cutting device for wind g
   2. Selection and supply of gum low
   3. Setting cutter for window patch

G. Alignment

H. Scoring

RELATED KNOWLEDGE

A. Nomenclature and terminology used in industry

B. Simple mathematics

C. Safety precautions

D. Weights and qualities of paper

E. Various types of ink and their qualities

F. Various gums and their usage

G. Use of hand tools

H. Care and maintenance of equipment and tools

I. Read rule.

I. Side and Bottom Flap Folding

J. Delivery Unit

K. Check of Each Stage of Set-Up

L. Diagnosis and Correction of Operating Troubles

M. Unconventional Shapes

N. Maintenance Procedures

3B. Training Objectives:

Trainees should gain sufficient knowledge to set up a wide-range window machine with a minimum of supervision for a short period of time prior to working on own.

3c. Performance Requirements:

Graduates of the training program should have developed sufficient skills to enable them to follow a production order in adjusting feed mechanism and aligner chain, setting up the printing press, window-cutting and patching, flap scoring and folding, gumming and delivery portions of the wide-range window machine to manufacture envelopes from pre-cut blanks. Must be able to diagnose reason for malfunctions and correct same. Set up must be accurate to insure production schedules are met and waste is at a minimum. Must be able to perform maintenance work on machines with a minimum of supervision.

Effectiveness of Norms:

Only 65% of the non-test selected workers used for this study were good workers; if the workers had been test - selected with the S-394 norms, 82% would have been good workers. 35% of the non-test-selected workers used for this study were poor workers; if the workers had been test-selected with the S-394 norms, only 18% would have been poor workers.

Applicability of S-394 Norms

The aptitude test battery is applicable to jobs which include a majority of duties described above.

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UNITED STATES OF AMERICA

PUBLIC EMPLOYMENT SERVICE